WISCONSIN
HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

CUMULATIVE REPORT 1998-2001

STATE OF WISCONSIN
DEPARTMENT OF HEALTH AND FAMILY SERVICES
Division of Public Health
Bureau of Environmental Health

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INTRODUCTION

Since 1990, the Agency for Toxic Substances and Disease Registry (ATSDR) has maintained and funded an active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) System to describe the public health consequences associated with the release of hazardous substances. Since 1992, the Wisconsin Department of Health and Family Services(DHFS)/ Division of Public Health (DPH) has participated in this surveillance system. This report summarizes the characteristics of events reported to the surveillance system by the DPH during calendar years 1998 through 2001.

Information on acute hazardous substances emergency events was collected. The types of data collected included general information on the event, substance(s) released, number of victims, number and types of adverse health effects experienced by the victims, and number of evacuations. Events are divided into two major categories; fixed-facility events and transportation events. Events are defined as transportation-related if they occurred during surface, air, pipeline, or water transport of hazardous substances; all other events are considered fixed-facility events.

Numerous data sources were used to obtain the maximum amount of information about each event. These sources included, but were not limited to: the Wisconsin Department of Natural Resources (DNR); the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP); the Wisconsin Department of Military Affairs (DMA); the Wisconsin Department of Justice (DOJ)/Division of Criminal Investigation (DCI)/Narcotics Bureau/(NB); the National Response Center (NRC); U.S. Department of Transportation (U.S.DOT)/Hazardous Materials Information System (HMIS); and local organizations including fire departments and law enforcement. Prior to January 2000, the data obtained were computerized using an ATSDR-provided data entry system and were sent to ATSDR quarterly. Beginning in January 2000, data were entered into a Web-based data entry system that allows for real-time data entry.

SELECTED FINDINGS

During the period 1998-2001, the DPH reported a total of 1,916 events; approximately 877 (45.8%) of the events occurred at fixed facilities, and 1,039 (54.2%) were transportation-related. Equipment failure was the factor reported most frequently, contributing to 317 (36.2%) of the fixed facility events for the period. The contributing factor for 280 (31.9%) of fixed facility events was Human error. In all of the 1,916 events, a single substance was released, with mixtures treated as single substances. Among all events (fixed and transportation), the most commonly reported substance release categories were: Other, (31.9%); Acids (12.2%); Other Inorganic, (11.7%); VOCs (9.1%); and Ammonia (7.7%). During this reporting period, 121 events (approximately 6.3% of all reported events) resulted in a total of 614 victims. For all events, the adverse health effects most frequently experienced by victims were Respiratory Irritation (36.0%), Skin Irritation (16.7%), Eye Irritation (13.4%), Shortness of Breath (9.0%), and Headache (8.4%). For the four-year period, a total of 4 persons died as a result of exposure to hazardous materials, and 216 events (11.3% of all events) required evacuations.

HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

GOALS

The surveillance system has four goals:

- To describe the distribution and characteristics of hazardous substances emergencies.
- To describe the morbidity and mortality experienced by employees, responders, and the general public as a result of hazardous substances releases.
- To identify risk factors associated with the morbidity and mortality.
- To identify strategies that might reduce future morbidity and mortality resulting from the release of hazardous substances.

This report summarizes the characteristics of hazardous substance releases and the associated public health consequences of events reported to the surveillance system during calendar years 1998 through 2001.

METHODS

Releases qualify for the HSEES System if they are uncontrolled or illegal and require removal, cleanup, or neutralization according to federal, state, or local law. Threatened releases are also included in the system if 1) they involve actions such as evacuations which are taken to protect the public health and 2) they would have required removal, cleanup, or neutralization according to federal, state, or local law. A substance is considered hazardous if it can be reasonably expected to cause injury or death to an exposed person. Releases occurring to air and water that could not be cleaned up are also included in the system if the amount released would have needed to be cleaned up if the spill had occurred on land. Events involving only petroleum products are excluded.

Various data sources were used to obtain information about these Wisconsin HSEES events. These sources included, but were not limited to the Wisconsin Department of Natural Resources (DNR); the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP); the Wisconsin Department of Military Affairs (DMA); the Wisconsin Department of Justice (DOJ)/Division of Criminal Investigation (DCI)/Narcotics Bureau/(NB); the National Response Center (NRC); U.S. Department of Transportation (U.S.DOT)/Hazardous Materials Information System (HMIS); and local organizations including fire departments and law enforcement agencies. Census data were used to estimate the number of residents living in the vicinity of the events. For each event, information was collected about the type of event (fixed-facility or transportation-related event); substance(s) released (identity, chemical form, type of release, and quantity released); victim(s) (population group, type of injury sustained, medical

outcome, demographics, personnel protective equipment [PPE] worn, and distance from the event); the type of area in which the event occurred; date and time of occurrence; numbers of persons potentially affected; use of environmental sampling; evacuations; response plans; and causal factors.

The manner in which the Wisconsin HSEES Program receives notification of hazardous materials events varies according to contributing agency. Reports from DNR and DATCP are received via E-mail as attachments, often on the same day as the event. DOJ/DCI/NB reports are faxed soon after special agents have submitted them to their supervisors. In addition, hard copies of spill reports are accessed at the foregoing agencies (and at DOJ) during periodic semi-annual reviews of their spills data. All notifications from State Agencies are submitted on a voluntary-partnership basis. NRC reports are faxed to the program soon after they are logged-in at the Washington DC HQ. Spill reports from U.S. DOT/HMIS are E-mailed to the program following a data integration period in their agency.

Emergency events captured by HSEES are classified according to whether they occur at fixed facilities or during transportation. Fixed-facility events involve hazardous substances released at industrial sites, schools, farms, or other permanent facilities; transportation-related events involve hazardous materials released during transport by surface, air, or water.

Victims are defined as individuals with symptoms (including psychological stress) or injuries (including death) that result from the event. Victims who receive more than one type of injury are counted once in each applicable type of injury.

Substances are grouped into 11 categories: Acids, Ammonia, Bases, Chlorine, Mixtures, Paints and Dyes, Pesticides, Polychlorinated Biphenyls, Volatile Organic Compounds (VOCs), Other Inorganic Substances, and Other Substances. The “Mixtures” category consists of chemicals from different categories that are mixed before release, and the “Other Substances" category consists of chemicals that cannot be classified into any one of the other 10 chemical categories. The category “Other Inorganic Substances” comprises all inorganic substances except Acids, Bases, Ammonia, and Chlorine, which constitute separate categories in the HSEES System.

Prior to January 2000, data were computerized using a data entry system provided by ATSDR, and sent to ATSDR quarterly. Since January 2000, data has been entered into a Web-deployed data entry system. ATSDR performs data management, data analysis, and report generation of the entered data. ATSDR provides DPH with its own state-level data for analysis and report generation purposes. HSEES data are then used for prevention activities by ATSDR and by DPH.

RESULTS

A total of 1,916 hazardous substances emergency events were reported during calendar years 1998-2001 to the HSEES system by the DPH. Of the total events, 1,870 (97.6%) were actual releases, 35 (1.8%) threatened releases (with health actions), and 11 events (0.005%)

involved substances where the release was both actual and threatened. There were 877 (45.8%) fixed-facility events, and 1,039 (54.2%) transportation-related events (Table 1). Table 2 shows the number of events by county and type of event.

Among fixed-facility events, known areas of occurrence most frequently reported were Storage (areas) Above Ground (20.2%), Process Vessel (17.7%), Piping (13.0%), Other (9.8%), Material Handling Areas (9.0%), and Transformer (6.5%). Areas of occurrence were unknown for 10.9% of the fixed-facility events (Figure 1). In transportation-related events, 94.1% occurred during ground transport (for example, truck, van, or tractor), 3.2% involved transport by rail, and 1.2% involved transport by air. The mode of transportation for the remaining transportation-related events (1.5%) was unknown (Figure 2).

Factors contributing to fixed facility events were also reported (Figure 3). Equipment Failure was the factor reported most frequently, contributing to 317 (36.1%) of the fixed facility events for the period. The contributing factor for 280 (31.9%) of fixed facility events was Operator/Human Error. For 107 (12.2%) of fixed facility events, the causal factor was reported as Unknown; in 41 (4.7%) of the events, the factor was Deliberate Damage; and the remainder were attributable to other factors. (Information about factors contributing to transportation events was not collected until 2000.)

All events for the period involved the release of only one substance. Mixtures were treated as single substances (Table 3).

Chemicals were either released or threatened to be released in the events. Of the 1,916 total events, 1,870 (97.6%) were actual releases, 35 (1.8%) threatened releases (with health actions), and 11 events (0.6%) involved substances where the release was both actual and threatened. The number of substances released was not higher than the number of events. Most substances released were either spills (86.1%) or air emissions (9.0%). Of the 1,650 total spills, 40.2% occurred in fixed-facility events; 59.8% during transport. Of the 173 total air emissions, 89.0% occurred at fixed facilities, while 11.0% happened during transportation. Of the remaining release types, fire and explosion combined, were reported in 0.5% of events. For 73 events (3.8%), release type was not known or not reported.

Of the events with known time of occurrence, 35.7% occurred from 6:00 AM to 12 noon, and 28.1% from 12 noon to 6:00 PM. Of the 1,916 total events, 1,691 (88.3%) occurred on weekdays. The number of weekday events ranged from a low of 322 (Fridays) to a high of 360 events (Wednesdays). The average number of weekday events was about 338. There were 225 weekend events reported over the four-year period; 119 on Saturday, 106 on Sunday.

During the four-year period 1998-2001, 64.5% of the events occurred from April 1 through September 30, and 35.5% during the other half-year period. In each of the years, more events 280 (14.6% of total events) happened during May than any other single month. The average number of May events was 70; with the range 64-76 events. June events were the next highest for the period, 212 events (11.1%): average 53; range 39-63.

SUBSTANCES

Of the 11 categories into which HSEES substances were grouped, the categories of substances most commonly released in fixed-facility events were Other Substances (27.6%), Ammonia (14.7%), Other Inorganic Substances (14.3%), and VOCs (10.7%). In transportation-related events, Other Substances (35.6%), Acids (15.9%), Pesticides (10.4%), and Other Inorganic Substances (9.6%) were most frequently released (Table 4). The 10 substances most frequently released in Wisconsin during calendar years 1998 through 2001 are listed in Appendix A.

VICTIMS

A total of 614 victims were involved in 121 events (6.3% of all reported events). Of the events with victims, 35.5% involved only one victim; 20.7% involved two victims; 22.3% involved three, four or five victims; and 21.5% involved six or more victims. Of the 614 total victims for all events, 526 persons (85.7%) became victims during fixed-facility events, and 88 persons (14.3%) during transportation-related events (Table 5).

Table 6 shows that high release frequency in a category may not result in a correspondingly high percentage of victims. For example, substances in category Other Substances were released during 612 events; however, only 19 (3.1%) of these events resulted in adverse health effects. Conversely, substance category, Chlorine, was released in only 24 events, and eight (33.3%) of these events resulted in adverse health effects. Similarly, substance category, Ammonia, was released in 146 events (7.6% of total events), and accounted for 9.3% of total victims, thus indicating its greater potential for immediate harm.

The population groups most often adversely affected for both fixed-facility and transportation-related events were Employees (49.8% of total victims), Students (24.4%), and General Public (18.2%) (Figure 4). There were 33 first responder victims in fixed-facility events. Of those, Police Officer accounted for 36.4%, Professional Firefighter 24.2%, Volunteer Firefighter 24.2%, Hospital Personnel 12.1%, and Company Response Team 3.0%. There were 13 first responder victims in transportation-related events. Of these, 53.8% were Police Officer, 23.1% Professional Firefighter, and 23.1% Volunteer Firefighter (Figure 5).

The types of adverse health effects sustained by victims are shown in Figure 6 and Table 7. The victims sustained a total of 1,086 adverse health effects, with some victims suffering more than one adverse health effect during a single event. The four most commonly reported adverse health effects in fixed-facility events were Respiratory Irritation (37.0%), Skin Irritation (15.8%), Eye Irritation (13.7%), and Shortness of Breath (9.5%). In transportation-related events, the four most commonly reported adverse health effects were Respiratory Irritation (28.8%), Skin Irritation (22.7%), Headache (13.6%), and Eye Irritation (10.6%).

Of the 614 total victims, the sex of 358 (58.3%) was known. Among the victims for whom the genders were known, 69.0% were male, 31.0% were female. Among the population groups (victim categories), more Employees (75.6%) and Responders (73.9%) were male. However, females accounted for 55.8% of those in the General Public who became victims.

Students made up 24.4% of total victims; gender was unknown for 93.3% of these student victims. The age of 58.3% of the victims was known: of these, the mean age among females was 26 years, and among males 30; the range among females was 3 to 58 years (median, 23.0), and among males from 4 to 60 years (median, 34).

As seen in Figure 7, the four most frequent injury outcomes (victim dispositions) were Treated At Hospital (not admitted), 76.7%; Treated On Scene (first aid), 10.9%; Treated At Hospital (admitted), 8.5%; Treated By Private Physician (within 24 hours), 1.9%. There were four fatalities resulting from exposure to hazardous substances during the four-year period.

Over the four-year period, 95.0% of all victims had not worn any form of PPE. Among victim categories, 98.3% of Employees, 98.2% of the General Public, 50% of Responders, and 100% of Students had not worn any form of PPE. For Professional Firefighter victims (total 11) reported as wearing PPE, 54.5% wore Level-A gear, 36.4% wore Level-B gear. Of the 11 Volunteer Firefighter victims, 10 of them (90.9%) were wearing firefighter turn-out gear. Among the 19 total Police Officer victims, 17 (89.5%) had worn no PPE.

Level "A" protection is worn when the highest level of respiratory, skin, and eye protection is needed. It includes a supplied-air respirator, approved by the Mine Safety and Health Administration (MSHA), U.S. Department of Labor, and the National Institute for Occupational Safety and Health (NIOSH); pressure-demand, self-contained breathing apparatus; fully encapsulating chemical-resistant suit; coveralls; long cotton underwear; chemical resistant gloves (inner); boots, chemical-resistant, steel toe and shank; hard hat; disposable gloves and boot covers; cooling unit; and 2-way radio communications. Level "D" is worn as a work uniform and is not recommended for sites with respiratory or skin hazards. Level "D" includes coveralls, gloves, boots/shoes (leather or chemical-resistant, steel toe and shank), safety glasses or chemical splash goggles, and hard hat. Level "D" provides no protection against chemical hazards. Firefighter turnout gear is protective clothing normally worn by firefighters during structural fire-fighting operations, and is similar to level "D" protection.

Each of the four persons who died (1998- 2001) as a result of hazardous substance releases was a male employee. The first fatality for the period (1999) took place at a coating/manufacturing (fixed) facility where the 37 year-old was exposed to a combination of molten metal and an unknown alkali, which resulted in both thermal and chemical burns. The second fatality (2000) involved a 15-year-old part time employee at a Boy Scout camp who died of carbon monoxide poisoning. Also in year 2000, the third fatality occurred following an exposure to phenol during a transportation event (unloading a rail tanker car) when a 34-year-old suffered respiratory and skin irritation before expiring. During 2001, the fourth fatality, involving a 44-year-old occurred at a food processing plant following an exposure to anhydrous ammonia.

EVACUATION

Evacuations were ordered in 216 (11.3%) of total events. Among the total evacuations, 161 (74.5%) of them were of a building or the affected part of a building; 35 (16.2%) were in both a circle/radius and downstream; 10 (4.6%) were in a circle/radius, only; 8 (3.7%) took place downwind/downstream from the event; and 2 (1.0%) were reported as having no criteria. The

median number of persons evacuated was 20, ranging from a high of 1,434 to a low of 1. The median length of evacuation was 2 hours, ranging from a high of 110 hours to low of 1 hour. In 11 events, in-place sheltering was ordered by an official, and instructions regarding precautions to take during in-place sheltering were provided by an official in each of those events.

CONTINGENCY PLANS

For 1,895 events, the types of contingency or preparedness plans were available from the data; in 21 events the information was missing. Contingency plan types varied as follows: Company's Operating Procedures, 73.5%; HazMat Response Team Standard Operating Procedure, 16.6%; Incident-Specific Ad Hoc Plan, 6.1%; Other, 2.3%; and Unknown, 1.3%.

WISCONSIN AMMONIA RELEASES (1998-2001)

Additional analyses were conducted of events involving ammonia to determine their association with adverse public health consequences such as personal injuries and evacuations. Ammonia was the most frequently released substance name reported to the Wisconsin HSEES Program during the four-year period (Appendix A). (Note: The analyses included the following substance names, only; "ammonia", anhydrous ammonia, and "ammonia NOS"; derivatives, such as ammonium compounds, were not included.) Under this definition, there were 148 ammonia events for the period, 7.7% of total events. Of total ammonia events, 130 (87.8%) occurred at fixed facilities, 18 (12.2%) were transportation-related. Fifty-four of the ammonia events (36.5% of total ammonia events) were in quantities of less than 100 lbs.

Among the 148 total ammonia events, 17 events (11.5%) resulted in 57 ammonia victims, (9.3%) of total victims (during all events) for the period. The three most frequent injury types among ammonia victims were Respiratory Irritation (45.5%), CNS Symptoms (dizziness) (21.2%), and Eye Irritation (15.2%). Types of victims were distributed among various categories including 48 Employees, 84.2% of total ammonia victims; 6 General Public, 10.5% of total ammonia victims; and 3 Responders (2 Police Officers and 1 Volunteer Firefighter), 5.3% of total ammonia victims. Victim dispositions included 43 persons, (75.4% of total ammonia victims) who were transported to (and treated at) a hospital, but not admitted; 9 persons (15.8%) who were treated at the scene with first-aid; and 3 persons (5.3%) who were transported to a hospital and admitted. Included among these ammonia victim dispositions was one male fatality, an employee at a food processing plant who was exposed during a 2001 event.

Evacuations were ordered in 54 ammonia events, (36.5%) of total ammonia events. Ammonia evacuees ranged from 2 to 750 for the period, and totaled 3,167 persons, 14.6% of all evacuees during the four-year period.

Exposures to gaseous or liquid ammonia in Wisconsin have caused respiratory and eye irritation, as well as dizziness. Other symptoms have included severe burns. Though the HSEES system does not track long term effects of hazardous material exposures, permanent damage to lungs and eyes has been known to be a result of ammonia exposure. Over time, the numbers of ammonia events, total ammonia victims and total ammonia evacuees have been relatively

consistent. For example, over an 8-year period (1993-2000) ammonia events made up 11% of total events, accounted for 14% of total victims, and produced 17% of total evacuees. During the 4-year period under consideration (1998-2001), ammonia events have made up 7.7% of total events, accounted for 9.3% of total victims, produced 14.6% of total evacuees, and resulted in one (2001) fatality.

State HSEES Program staff has undertaken, and continues to be interested in, several prevention/outreach areas, including chorine (swim pool) outreach, and expanded stakeholder opportunities for HSEES data-usage via the Wisconsin Health Alert Network (HAN). In addition, based on the frequency of ammonia events, victims and evacuees (outlined above), program staff has augmented and refocused its ammonia prevention/outreach activities, as well. We note that most ammonia events reported to the HSEES Program have occurred in the industrial and agricultural sectors. It is known that ammonia is used as a chemical coolant for refrigeration in the food processing/storage industry, and as an additive for fertilizers. To address ammonia releases in these sectors, plans are currently being implemented to work collaboratively with the Wisconsin Committee On Occupational Safety and Health and local labor councils to schedule times for ammonia outreach activities where direct contact with workers will be achieved. In addition, plans are being formulated for prevention/outreach activity in the agricultural sector. (An article containing further information about ammonia releases in Wisconsin is cited in Appendix B.)

USES OF HSEES DATA (1998-2001)

During the four-year period (1998-2001), prevention/outreach activities were the organizing force behind data utilization. Data has shown that ammonia was the single most frequently released substance in Wisconsin (148 events, 7.7% of all events for the period). Ammonia outreach activities (since 1996) have included poster presentations at the Governor's Conferences On Emergency Management, at Wisconsin State AFL/CIO Conventions, Governor's Hazardous Materials Awareness Week functions (State Capitol Rotunda), and other utilizations such as fact sheets and PowerPoint presentations.

Data had also shown that every third Chlorine release in Wisconsin resulted in one or more victims and/or evacuees. Chlorine outreach activities for the period included poster presentations at the American Waterworks Association, and the Wisconsin Innkeepers Association State Convention. In addition, a "Memo To Chorine Users" was made available to virtually every public and private school system in Wisconsin, including the University of Wisconsin System, private colleges, and YMCA/YWCAs. Additional chlorine outreach plans are ready for implementation.

In support of DNR, analyses of selected chemical releases (ammonia, chlorine, phenol, certain acids, and others) indicated that victims and evacuees were resulting from releases that were less in quantity than the assigned federal reportable quantities. Through a PowerPoint presentation, these findings were brought to the attention of a DNR Advisory Group. After considering the data, the Advisory Group declined to make proposed changes in regulatory language which would have raised the reportable quantities pertaining to spill notification.

Lastly, data was analyzed and used to create stakeholder-operated, tabular Excel fact sheets for use on the Wisconsin Health Alert Network (HAN), which contained information about HSEES Events, including event county, event city, substance name and quantity, number of victims, number of evacuees, event type, and event ID. A vastly expanded HSEES/HAN web presence is ready to be implemented during calendar 2002.

SUMMARY OF RESULTS (1993–2001)

From the first year of data collection (1993) through the last complete year of data collection (2001), there were a total of 3,753 qualifying hazardous material events reported to the Wisconsin HSEES Program. The mean annual number of events was 427; range 334-508. Improved reporting sources resulted in an increase in the number of reported transportation events, especially from 1998-2001. For the 9-year period, the annual number of events with victims has been relatively consistent, with only two years at less than 28 events (mean 28, range 19-32); the mean number of victims for the period was 115, however, from 1997 through 2001 the mean for victims has increased to 148. The mean number of events with evacuation for the 9-year period was 49; with the mean number of evacuees being 4,077 (range 932 to 7,552). For the period, five fatalities resulted from exposure to hazardous materials; one in each of 3 years, and 2 during calendar year 2000 (Table 8). Among victim types, Employees were the group most frequently effected by hazardous material releases, except for 1998 when a large number of students became victims during a single event (Figure 8). There were a total of 3,845 substances released during the 3,753 total events; although from 1997 through 2001 the number of substances released was the same as the number of events, with mixtures being treated as single substances (Figure 9).

Data over the 9-year period, especially the increase in the mean number of victims (1997-2001), strongly suggest that the prevention/outreach activities associated with ongoing surveillance be continued and expanded. Plans are being implemented to enhance outreach activities directed at workers with potential for exposure to ammonia in the workplace. Similarly, workers at swim pools have been recognized as outreach clients because of the high incidence of victims and evacuees during chlorine and pool chemical releases. A HSEES web-presence has been achieved on the Wisconsin HAN with the overarching goal of providing expanded data accessibility to a wide range of individuals in numerous agencies. HSEES data is being used to assist Wisconsin laboratories in prioritizing analytic protocols in preparation for chemical incidents.

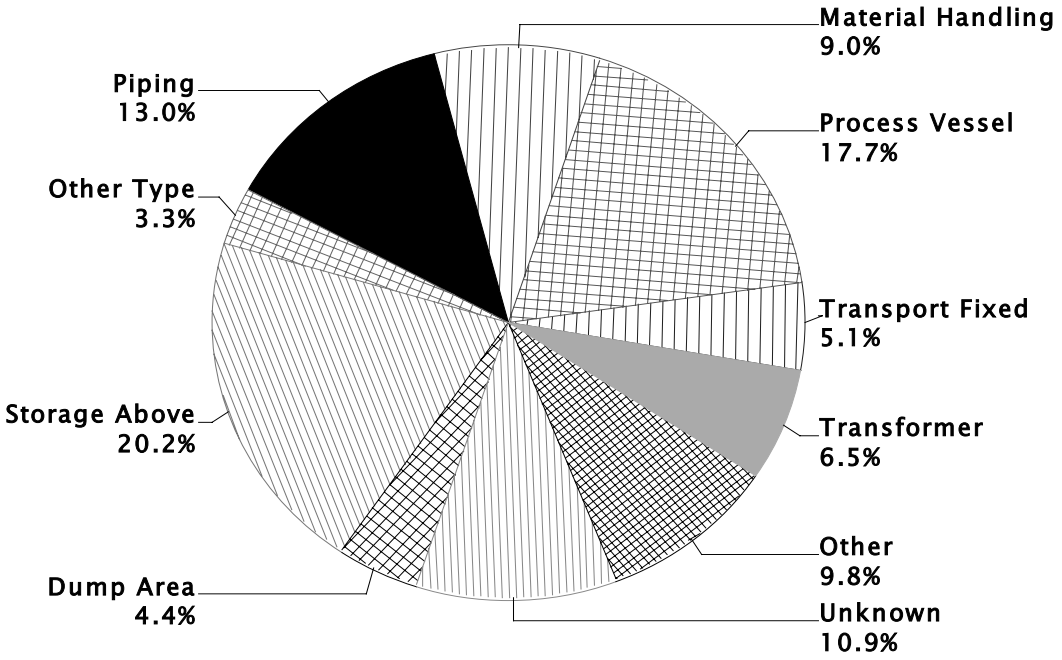
TABLES AND FIGURES

Table 1.—Number of events meeting the surveillance definition, by year and type of event, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001

Year	Type of Event				Total Events
	Fixed Facility		Transportation		
	No. of Events	%	No. of Events	%	
1998	218	24.9%	205	19.7%	423
1999	238	27.1%	269	25.9%	507
2000	199	22.7%	279	26.9%	478
2001	222	25.3%	286	27.5%	508
Total	877	100.0%	1,039	100.0%	1,916

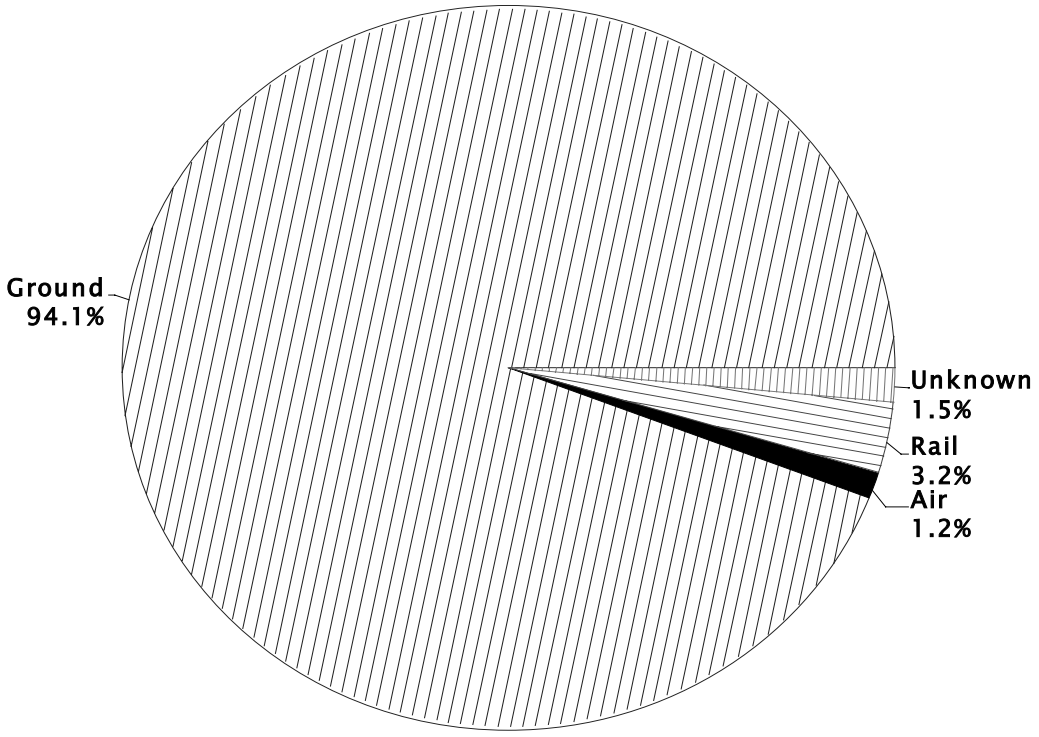
Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Figure 1. —Areas of fixed facilities involved in events, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.



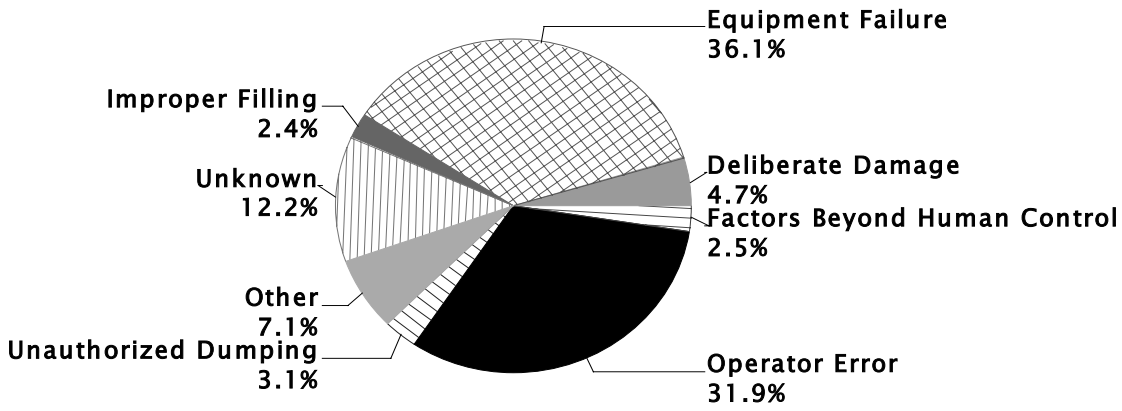
Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Figure 2. —Distribution of transportation-related events, by type of transport, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Figure 3. —Factors reported as contributing to the occurrence of fixed-facility events, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Table 2.—Number of events meeting the surveillance definition, by county and type of event, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001

County	Type of Event				Total Events
	Fixed Facility		Transportation		
	No. of Events	%	No. of Events	%	
Adams	4	36.4%	7	63.6%	11
Ashland	3	100.0%	0	0.0%	3
Barron	9	75%	3	25%	12
Brown	34	37.0%	58	63.0%	92
Buffalo	1	33.3%	2	66.6%	3
Burnett	6	85.7%	1	14.3%	7
Calumet	2	40.0%	3	60.0%	5
Chippewa	6	33.3%	12	66.7%	18
Clark	7	63.6%	4	36.4	11
Columbia	12	63.2%	7	36.8%	19
Crawford	6	50.0%	6	50.0%	12
Dane	82	48.0%	89	52.0%	171
Dodge	5	45.5%	6	54.5	11
Douglas	12	63.2%	7	36.8%	19
Dunn	5	38.5%	8	61.5%	13
Eau Claire	16	55.2%	13	44.8%	29
Fond Du Lac	23	63.9%	13	36.1	36
Grant	6	35.3%	11	64.7%	17
Green	7	53.8%	6	46.2%	13
Green Lake	4	66.7%	2	33.3%	6
Iowa	8	80.0%	2	20.0%	10
Jackson	3	50.0%	3	50.0%	6
Jefferson	38	84.4%	7	15.6%	45
Juneau	2	4.5%	42	96.5%	44
Kenosha	18	72.0%	7	28.0%	25
Kewaunee	4	100.0%	0	0.0%	4
La Crosse	17	47.2%	19	52.8%	36
Lafayette	2	22.2%	7	77.8%	9
Langlade	3	100.0%	0	0.0%	3
Lincoln	0	0.0%	1	100.0%	1
Manitowoc	11	64.7%	6	35.3%	17
Marathon	27	67.5%	13	32.5%	40
Marinette	9	60.0%	6	40.0%	15
Marquette	2	40.0%	3	60.0%	5
Milwaukee	194	36.7%	335	63.3%	529
Monroe	6	7.3%	76	92.7%	82

Table 2., Continued					
County	Type of Event				Total Events
	Fixed Facility		Transportation		
	No. of Events	%	No. of Events	%	
Oconto	3	50.0%	3	50.0%	6
Oneida	3	27.3%	8	72.7%	11
Outagamie	20	43.5%	26	56.5	46
Ozaukee	15	68.2	7	31.8%	22
Pepin	2	66.7%	1	33.3%	3
Pierce	2	50.0%	2	50.0%	4
Polk	13	72.2%	5	27.8%	18
Portage	10	28.6%	25	71.4%	35
Price	2	100.0%	0	0.0%	2
Racine	20	67.7%	10	33.3%	30
Richland	3	50.0%	3	50.0%	6
Rock	19	48.7%	20	51.3%	39
Rusk	1	100.0%	0	0.0%	1
Sauk	9	64.3%	5	35.7%	14
Sawyer	3	100.0%	0	0.0%	3
Shawano	0	0.0%	4	100.0%	4
Sheboygan	23	67.6%	11	32.4%	34
St. Croix	8	47.1%	9	52.8%	17
Trempealeau	7	63.6%	4	36.4%	11
Vernon	2	33.3%	4	66.7%	6
Walworth	20	74.1%	7	25.9%	27
Washburn	1	50.0%	1	50.0%	2
Washington	10	62.5%	6	37.5%	16
Waukesha	37	66.1%	19	37.9%	56
Waupaca	3	33.3%	6	66.7%	9
Waushara	0	0.0%	5	100.0%	5
Winnebago	21	29.2%	51	70.8%	72
Wood	23	65.7%	12	34.3%	35
Total	877	45.8%	1,039	54.2%	1,916

Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Table 3.—Distribution of the number of substances released, by type of event, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.

No. of Substances Released	Type of Event						All Events		
	Fixed Facility			Transportation					
	No. of Events	%	No. of Substances	No. of Events	%	No. of Substances	No. of Events	%	No. of Substances
1	877	100%	877	1,039	100%	1,039	1,916	100%	1,916
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
≥ 5	0	0	0	0	0	0	0	0	0
Total	877	100%	877	1,039	100%	1,039	1,916	100%	1,916

Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Table 4.—Distribution of the number of substances released, by substance category and type of event, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.

Substance Category	Type of Event				All Events	
	Fixed Facility		Transportation			
	No. of Substances	(%)	No. of Substances	(%)	No. of Substances	(%)
Acids	68	7.8%	165	15.9%	233	12.2%
Ammonia	129	14.7%	17	1.6%	146	7.6%
Bases	23	2.6%	93	9.0%	116	6.1%
Chlorine	22	2.5%	2	0.2%	24	1.3%
Mixtures	71	8.1%	41	3.9%	112	5.8%
Other Inorganic Substances	125	14.3%	100	9.6%	225	11.7%
Other Substances	242	27.6%	370	35.6%	612	31.9%
Paints and Dyes	28	3.2%	62	6.0%	90	4.7%
Pesticides	26	3.0%	108	10.4%	134	7.0%
Polychlorinated Biphenyls	49	5.6%	1	0.1%	50	2.6%
Volatile Organic Compounds	94	10.7%	80	7.7%	174	9.1%
Total	877	100.0%	1,039	100.0	1,916	100.0%

Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Note One: For the data analyses in this report, the substances released were categorized into eleven groups. The category "Mixtures" consists of mixtures of substances form different categories; the category "Other Inorganic Substances" comprises all inorganic substances except for "Acids", "Bases", "Ammonia", and "Chlorine". The category "Other Substances" refers to substances which could not be categorized elsewhere among the eleven groups.

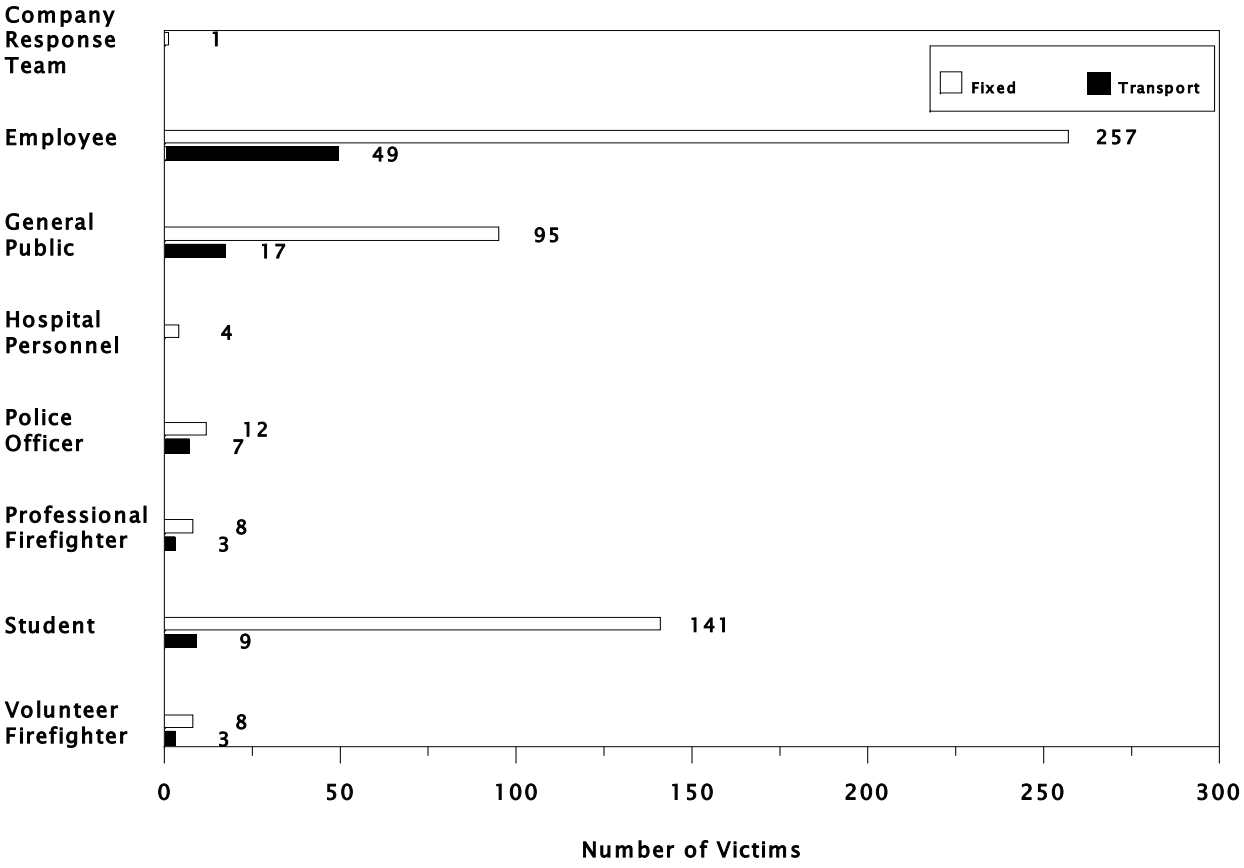
Note Two: In some years (though not for the four years under consideration in this report), the total number of substances released have exceeded the total number of events. However, the eleven groups (categories) will always contain 100% of the substances released for any given year(s).

Table 5.—Distribution of the number of victims, by type of event, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.

No. of Victims	Type of Event							All Events	
	Fixed Facility			Transportation					
	No. of Events	(%)	No. of Victims	No. of Events	(%)	No. of Victims	No. of Events	(%)	No. of Victims
1	30	33.0%	30	13	43.4%	13	43	35.5%	43
2	18	19.8%	36	7	23.3%	14	25	20.7%	50
3	11	12.1%	33	3	10.0%	9	14	11.6%	42
4	7	7.7%	28	3	10.0%	12	10	8.2%	40
5	3	3.3%	15	0	0.0%	0	3	2.5%	15
≥6	22	24.1%	384	4	13.3%	40	26	21.5%	424
Total	91	100.0%	526	30	100.0%	88	121	100.0%	614

Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Figure 4. —Distribution of victims by population group and type of event, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

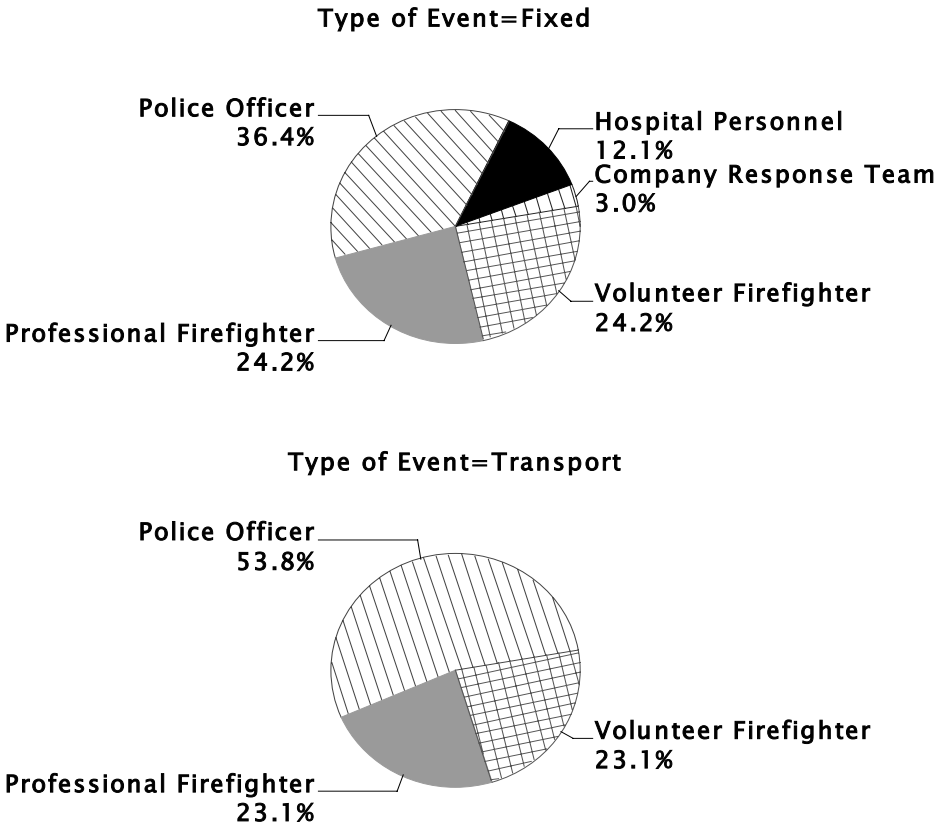
Table 6.—Number of substances released in all events and events with victims, by substance category, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.

Substance Category	Total Releases		Releases with Victims		
	Number	Percentage of Total Releases	Number	Percentage of All Releases with Victims	Percentage of Releases in Substance Category
Acids	233	12.2%	22	18.2%	9.4%
Ammonia	146	7.6%	17	14.0%	11.6%
Bases	116	7.6%	3	2.5%	2.6%
Chlorine	24	1.3%	8	6.6%	33.3%
Mixtures	112	5.8%	17	14.0%	15.2%
Other Inorganic Substances	225	11.7%	20	16.5%	8.9%
Other Substances	612	31.9%	19	15.7%	3.1%
Paints and Dyes	90	4.7%	0	0.0%	0.0%
Pesticides	134	7.0	5	4.1%	3.7%
Polychlorinated Biphenyls	50	2.6%	0	0.0%	0.0%
Volatile Organic Compounds	174	9.1%	10	8.3%	5.7%
Total	1,916	100.0%	121	100.0%	6.3%

Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Note: For the data analyses in this report, the substances released were categorized into eleven groups. The category "Mixtures" consists of mixtures of substances from different categories; the category "Other Inorganic Substances" comprises all inorganic substances except for "Acids", "Bases", "Ammonia", and "Chlorine". The category "Other Substances" refers to substances which could not be categorized elsewhere among the eleven groups.

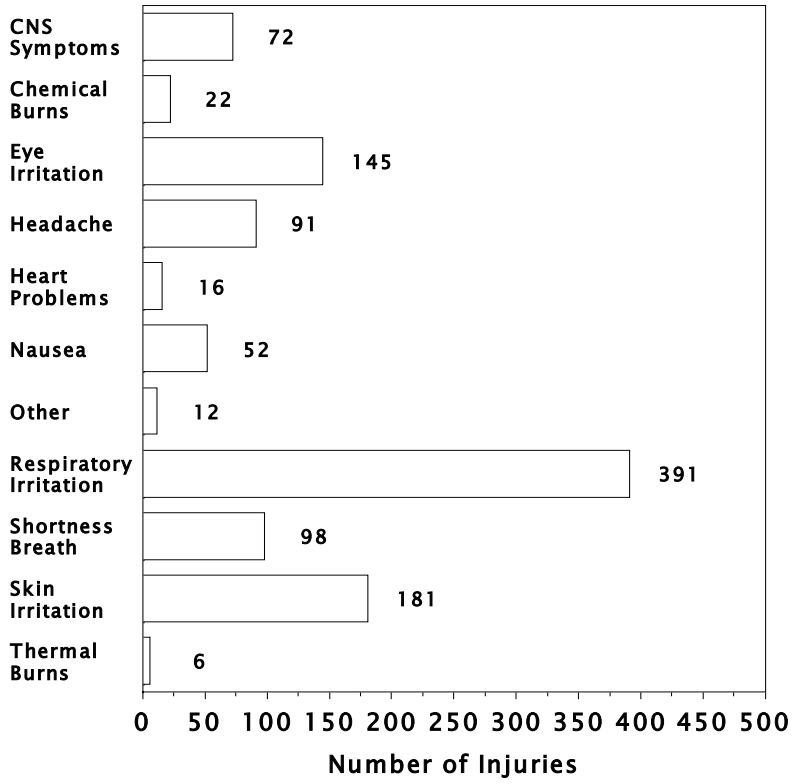
Figure 5. —Distribution of responder victims,* by population group and type of event, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

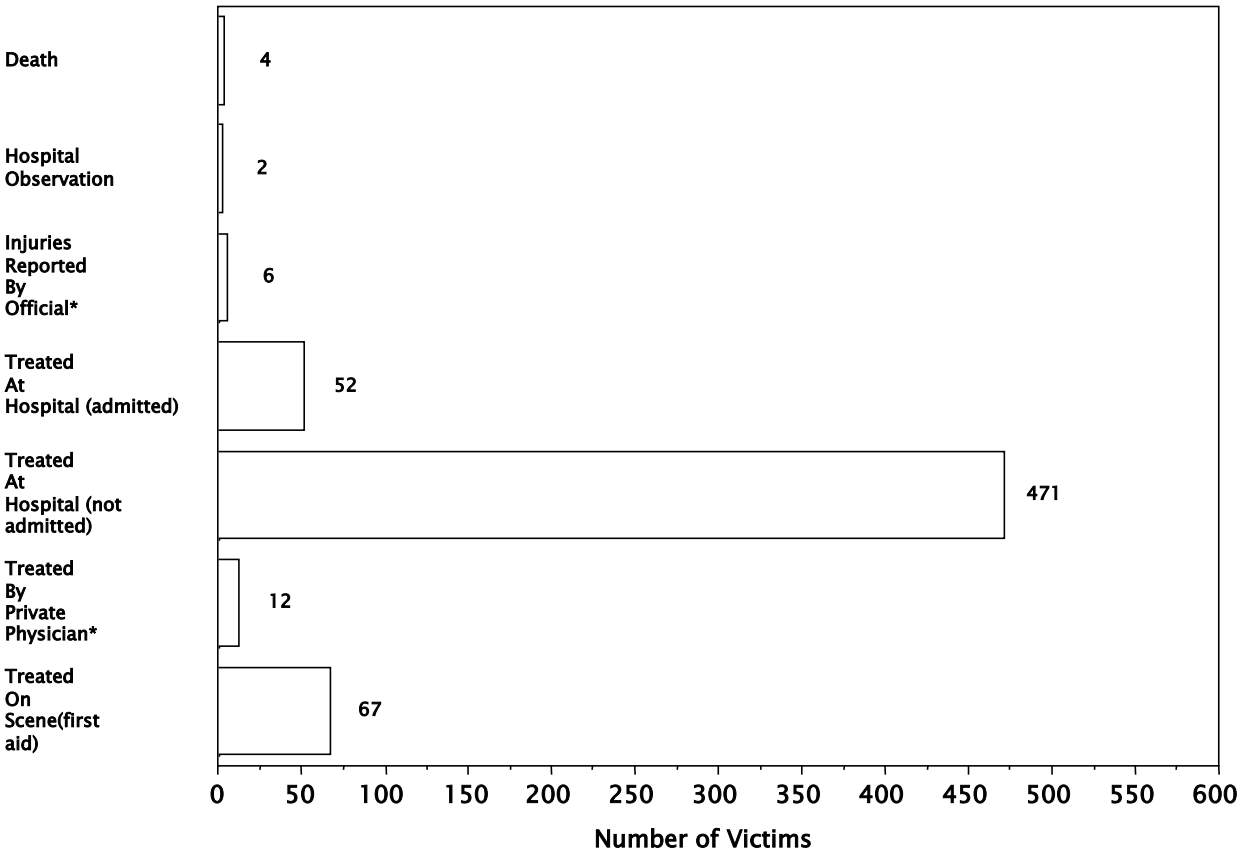
* Of the 46 total responder victims, 33 of them were injured in fixed-facility events, 13 in transportation-related events.

Figure 6. —Distribution of type of injury for all events, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Figure 7. —Injury outcome, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

* Within 24 hours.

Table 7.—Distribution of type of adverse health effect, by type of event,* Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.

Type of adverse health effect	Type of Event				All events	
	Fixed Facility		Transportation			
	No.	%	No.	%	No.	%
Chemical Burns	17	1.8%	5	3.8%	22	2.0%
Heart Problems	16	1.7%	0	0.0%	16	1.5%
Dizziness/CNS†	59	6.2%	13	9.8%	72	6.6%
Eye Irritation	131	13.7%	14	10.6%	145	13.4%
Headache	73	7.7%	18	13.6%	91	8.4%
Heat Stress	0	0.0%	0	0.0%	0	0.0%
Gastrointestinal Problems	47	4.9%	5	3.8%	52	4.8%
Respiratory Problems	353	37.0%	38	28.8%	391	36.0%
Shortness of Breath	91	9.5%	7	5.3%	98	9.0%
Skin Irritation	151	15.8%	30	22.7%	181	16.7%
Thermal Burns	6	0.6%	0	0.0%	6	0.6%
Trauma	0	0.0%	0	0.0%	0	0.0%
Other	10	1.0%	2	1.5%	12	1.1%
Total	954	100.0%	132	100.0%	1,086	100.0%

Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

* The number of injuries is greater than the number of victims, because a victim could have had more than one injury.

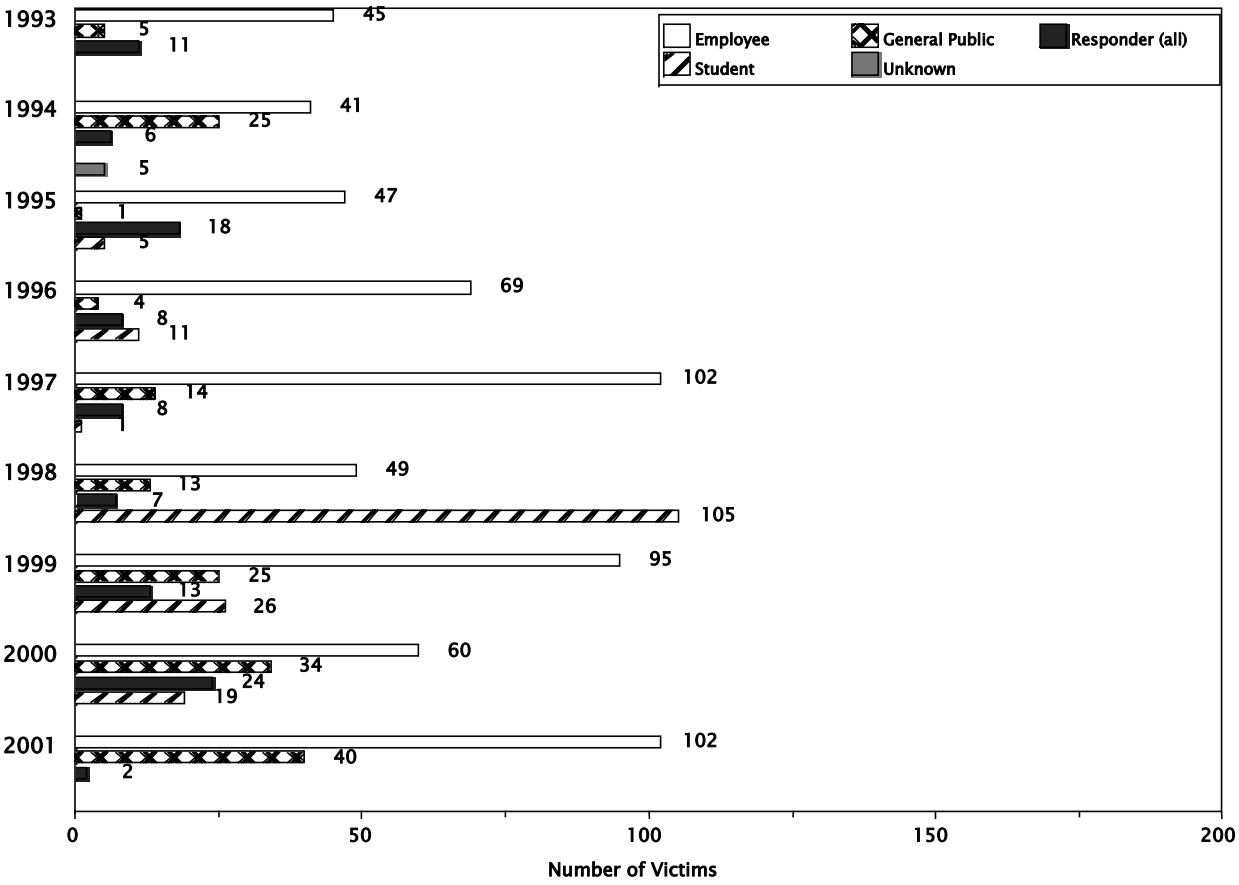
† Central nervous system symptoms.

Table 8.—Cumulative data, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1993-2001.

Year	Type of Event			No. of Substances Released	No. of Deaths	No. of Victims	Events with Victims	
	Fixed Facility	Transport	Total				No.	%
1993	290	60	350	359	1	61	29	8.3%
1994	223	175	398	466	0	77	30	7.5%
1995	283	125	408	420	0	71	19	4.7%
1996	211	120	331	334	0	92	21	6.3%
1997	216	134	350	350	0	125	34	9.7%
1998	218	205	423	423	0	174	32	7.6%
1999	238	269	507	507	1	159	28	5.5%
2000	199	279	478	478	2	137	31	6.5%
2001	222	286	508	508	1	144	30	5.9%
Total	2,100	1,653	3,753	3,845	5	1,040	254	6.8%

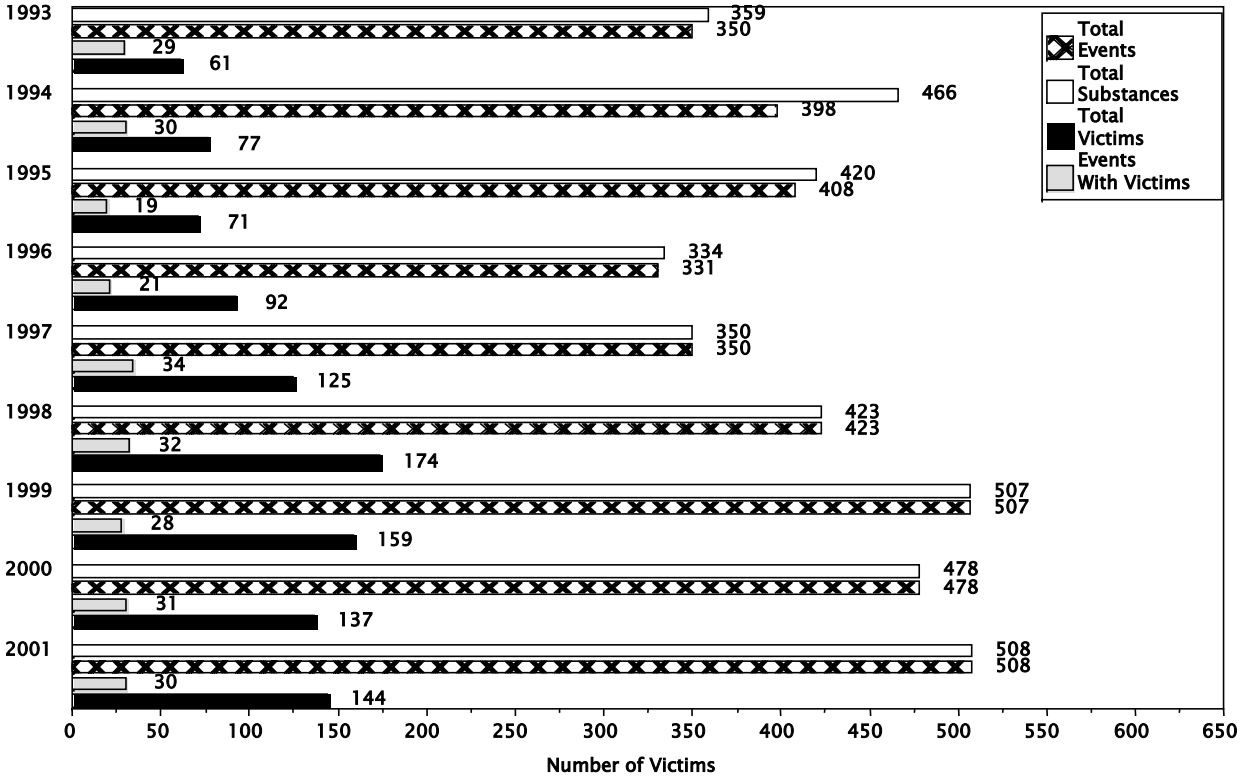
Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Figure 8.—Distribution of victims, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1993-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

Figure 9. —Cumulative data (total substances, total events, events with victims, and total victims) for Hazardous Substances Emergency Events Surveillance, Wisconsin, 1993-2001.



Source: Wisconsin Hazardous Substances Emergency Events Surveillance (HSEES) Program, Bureau of Environmental Health, Division of Public Health, Department of Health and Family Services.

APPENDICES

Appendix A. The 10 Most Frequently Released Substances, Hazardous Substances Emergency Events Surveillance, Wisconsin, 1998-2001.

Number	Standardized Substance Name	Frequency
1.	Ammonia*	144
2.	Corrosive NOS	104
3.	Acid NOS	66
4.	Paint or Coating NOS	60
5.	Flammable Liquid NOS	53
6.	Polychlorinated Biphenyls	50
7.	Sulfuric Acid	45
8.	Transformer Oil NOS	45
9.	Sodium Hydroxide	40
10.	Mercury	38
Total		645

* Note: Ammonia queries (searchs) in the HSEES data base included the following substance names, only: "ammonia", anhydrous ammonia, and "ammonia NOS"; derivatives, such as ammonium compounds, were not included. Substance names "ammonia" and "anhydrous ammonia" were detected in 144 events; "ammonia NOS", 2 events; and "ammonia" as part of a mixture, 2 events. Under this definition there were 148 ammonia events for the period.

Appendix B. Weisskopf MG, Drew JM, Hanrahan LP, Anderson HA. Hazardous Ammonia Releases in Wisconsin: Trends and Risk Factors for Evacuation and Injury. WI Medical J 2000; 99: 30-33.